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# Re-Imagining the Antarctic Treaty: Goals to Mitigate Ice Melting, Reduction of Zooplankton Communities, and Imbalances in the Arctic Ecosystem

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## ABSTRACT

In 2022, massive ice melts in Antarctica and Greenland reflect the human-induced impacts of climate change, and the necessity of using human solutions to respond to the global climate crisis. Although the current Antarctic Treaty characterizes Antarctica as a place of scientific reserve, it does not address the direct impacts of climate change on the cryosphere. Due to the growing mortality rate of the arctic zooplankton and their essentiality within the arctic food chain, this study proposes an "Emergency Antarctic Climate Treaty Protocol" that presents the effects of climate change on the Antarctic ecosystem as an "emergency." To better examine the correlation between ecosystems and human systems within the context of climate change, this research project asks: 1) How does characterizing the arctic zooplankton community as a "vulnerable species" address its essentiality to the arctic food chain? 2) What is the correlation between disruptive impacts to the arctic biosphere and negative impacts on human communities? 3) What role does the "Emergency Antarctic Climate Treaty Protocol" play in addressing the necessity of integrating emergency climate discourse into ice melt trends in the Antarctic? By targeting the ecological impacts of climate change through the arctic food chain, the proposed "Emergency Antarctic Climate Treaty Protocol" views the changing arctic ecosystem as mirroring effects of climate change on human communities, where the reduction of the arctic zooplankton species speaks to failures of the current Antarctic Treaty to address CO2 emissions.

## Introduction

By 2022, Antarctica and Greenland have lost over 7,560 gross tonnages of ice (Chown et al.)—with the encroachment of massive ice melts, the arctic ecosystem reflects the consequences of human-induced climate change. According to Hughes, Convey, and Turner, human-caused fossil fuel combustion and deforestation continue to impact our global climate, with the most rapid changes occurring in the arctic regions. With the enforcement of the Protocol on Environmental Protection to the Antarctic Treaty in 1998 restricting mining, waste disposal, and pollution in Antarctica (Hughes et al.; McIvor), the Antarctic Treaty is largely centered around reducing *direct* human activities—it does little to address the *indirect* effects of climate change. Chown et al. cite that rising global temperatures will lead to an extreme loss of biodiversity in terrestrial, freshwater, coastal, and marine ecosystems. With the changes in salinity due to a mix of melted ice water and ocean water, the arctic zooplankton community is rapidly decreasing (Weslawski and Legezynska; Laspoumaderes et al.). Using the growing mortality rate of arctic zooplankton in the Antarctic and Greenland as a measure of the inefficacies of current statutes of the Antarctic Treaty, this study examines the changing cryosphere as a predicate of the effects of climate change on human communities. This study proposes the introduction of an "Emergency Antarctic Climate Treaty Protocol" that views the changing arctic ecosystem as a climate emergency.

Within the arctic ecosystem, zooplankton play a pivotal role in the food chain, impacting human communities who rely on marine food sources. As Stempniewicz, Blachowiak-Samolyk, and Welawski note, zooplankton communities take on a critical role in the food chain, effecting the resources and growth rates of fish; reducing the number of zooplankton would drastically impact fish mortality rates. Moreover, a reduction of arctic zooplankton residually impacts fish-eating birds (Stempniewicz, Blachowiak-Samolyk, and Welawski) *and* human food sources and livelihoods, effecting both the distribution of nutrients via seabird colonies and human systems. As Vincent et al. observe, the interdependency of arctic ecosystems not only directly impact the cryosphere, but can lead to indirect impacts on northern human communities, enacting changes in global biodiversity and chemical cycles from non-living to living systems. Through the correlation between ecosystems and human systems, we see the importance of acknowledging the changes within the cryosphere via the "Emergency Antarctic Climate Treaty Protocol" *before* they further impact human activities. By targeting the ecological impacts of climate change through the arctic food chain, the proposed "Emergency Antarctic Climate Treaty Protocol" views the changing arctic ecosystem as mirroring effects of climate change on human communities, where the reduction of the arctic zooplankton species speaks to failures of the current Antarctic Treaty to address CO2 emissions.

## The Western Antarctic Peninsula

In Antarctica, the surface temperature of melting ice or snow cannot be greater than 0°C (Hock)—extreme temperatures caused by human CO2 emissions have gradually transformed the West Antarctic Peninsula (WAP) from a scientific reserve into an at-risk, "emergency locale." Braeckman et al. cite that in the latter half of the 20$^{th}$ century, the WAP has experienced rising temperatures, shortening its sea ice season by one hundred days, while almost 90% of its coastal glaciers have receded; such changes in the WAP cryosphere filter into marine ecosystems. As 90% of the Earth's freshwater is in Antarctica (Helmer, Doake, and Frolich), with the WAP especially vulnerable to extreme ice melt (Geisz et al.), its increasing meltwater carries sediment particles that can be detrimental to zooplankton communities (Hylander et al.; Zajaczkowski and Legezynska; Fuentes et al.). Moreover, the World Heritage Committee suggests that the water loss from melting glaciers can contribute to the spread of famine and disease (Carey 515). As a threat to the ecosystem and bilaterally, human systems, addressing the WAP as an "emergency locale" views eco-risks as *human* risks, blurring the ideological separation of the two within global climate change (in)action. Where the concept of "ecocide" (Gills and Morgan 2) links ice melt to genocide, the Antarctic Treaty has yet to address the ecological risks of the zooplankton community.

## Arctic Zooplankton and the Arctic Food Chain

At the bottom of the food chain, arctic zooplankton play a pivotal role in environmental functions (Mollmann et al.; Herbert, Beisner, and Maranger); their decline necessitates categorizing them as a "vulnerable species." According to Vincent et al., arctic zooplankton rely on sea ice as a major source of sustenance, feeding off of ice algae and ice edge phytoplankton blooms—these lipid-rich, arctic zooplankton then become a crucial food source for seabirds, fish, and other marine mammals. Where the Committee for Environmental Protection (CEP) curated a list of "specially protected" species in 2002 (McIvor 241), with the increase in ice water melt in the Arctic region (Samchyshyna, Hansson, and Christoffersen; Singh and Singh) and a decrease in sea ice (Clarke and Peck), the ecological necessity of zooplankton creates a case for their protection. Stempniewicz, Blachowiak-Samolyk, and Welawski's Figure 1 lists the risks of a "warm climate scenario" (1242) on zooplankton communities.

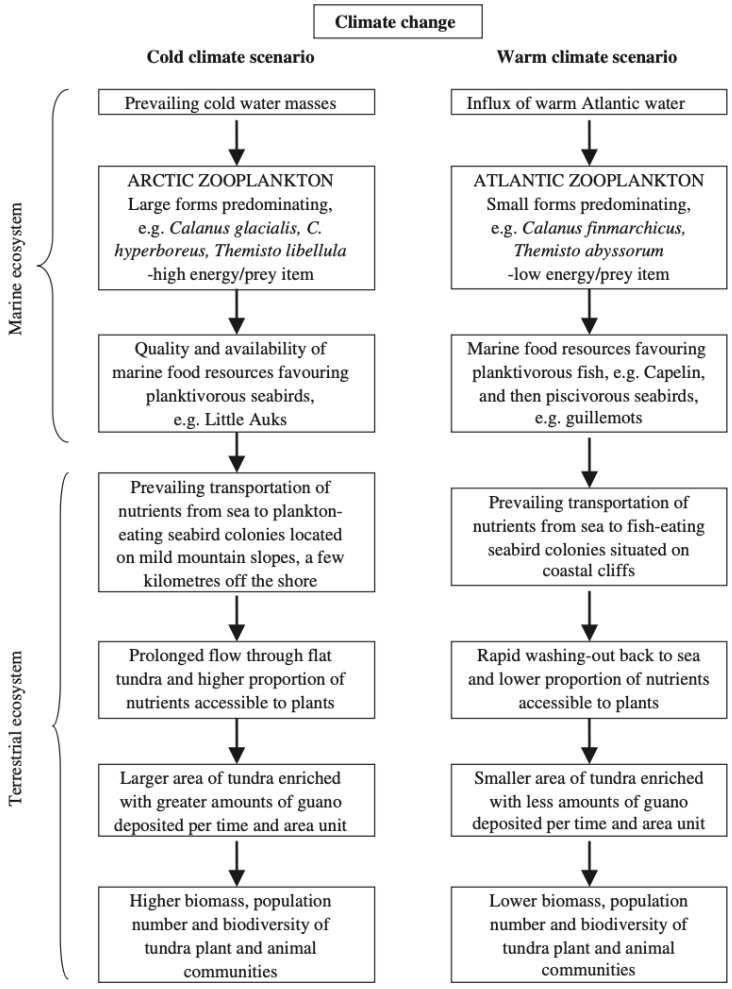


**Figure 1.** Chart showing the impact of climate change on zooplankton, seabirds, and the arctic terrestrial ecosystem from: Stempniewicz, Lech, Blachowiak-Samolyk, Katarzyna, and Welawski, Jan M., *Deep Sea Research Part II*, 2007, p. 1242.

Where "prevailing cold water masses" lead to large populations of arctic zooplankton and a higher "population number and biodiversity of tundra plant and animal communities," ice melting and warmer water leads to a smaller number of zooplankton and a lower "population number" and overall biodiversity (Stempniewicz, Blachowiak-Samolyk, and Welawski 1242). Here, *human-caused* ice melting necessitates *human* solutions. Where the Antarctic Treaty does not include climate change prevention (Hughes et al.), classifying zooplankton as a "vulnerable species" in an "emergency locale" may be some of the first steps towards filling the gaps within the Antarctic Treaty.

## The Antarctic Treaty: The Protocol on Environmental Protection

Introduced in 1991 and established in 1998, the Protocol on Environmental Protection to the Antarctic Treaty did not address the effects of global warming—which scientists have been aware of since the 1980s (Carey). As Hughes et al. observe, the Protocol on Environmental Protection to the Antarctic Treaty set out standards that characterized Antarctica as a "natural reserve, devoted to peace and science" in Article 2, enforcing its merit as an area contributive to major scientific research in Article 3, its scientific value shaping the nature of

future activities in the Antarctic (para 8). Although the Protocol on Environmental Protection exists in conjunction with attempts to classify Antarctica as "World Park" (Rothwell 287) and protect its environment (Hemmings; Orheim, Press, and Gilbert), it did not include any restrictions on the burning of fossil fuels or deforestation. Re-classifying the Protocol as an "Emergency Climate Treaty Protocol" in 2022 speaks to the possibility of benefitting the arctic ecosystem via human strategies. According to Convey, Hughes, and Turner, the scientific community will need to help policy makers understand the extent of the impact climate change has on the Antarctic ecosystem, while practically demonstrating conservation methods to address the regional changes caused by climate change. By establishing a clear connection between human inaction and ecological reactions, an "Emergency Climate Treaty Protocol" should address regional restrictions on fossil fuel combustion and deforestation in order to minimize damages to the zooplankton community. Since the introduction of climate change to global discourse in the 1980s, climate change policies have adopted a "not now, so who cares?" attitude, dismissing the urgency of ecological destruction as a future human rights violation.

## Ecological Rights and Human Rights

The correlation between ecological rights and human rights is crucial to re-examining the Antarctic Treaty. In 2019, the Dutch Supreme court case, *Urgenda*, pioneered the concept of climate inaction as a violation of future human rights, while enforcing the reduction of greenhouse gas emissions as an internationally recognized, governmental responsibility (Rodriguez-Garavito). Where *Urgenda* set a legal precedent for preventing "ecocide" (Gills and Morgan 2), by 2022, the Antarctic Treaty should match litigations that create incentives to minimizing climate change. In Figure 2, Convey, Hughes, and Tin elaborate on the interconnectivity between human and ecological systems and the necessity of policy and action.

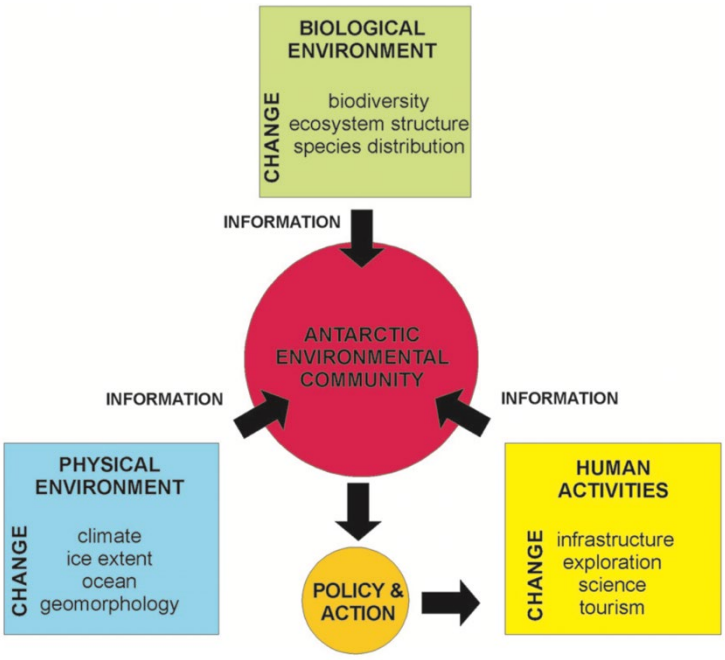


**Figure 2.** Chart showing the interconnectivity of biological environments, physical environments, policy and action, and human activities within the Antarctic environmental community from: Convey, Peter, Hughes, Kevin A., and Tin, Tina, *Biodiversity*, 2012, p. 10.

Where the biological environment of the Antarctic Environmental community requires policies and actions that reflect its needs, human activities have the power to change human systems that then positively

impact the Antarctic environmental community and be de facto, its biological environment (Convey, Hughes, and Tin). As human change is a key correlating factor to changing biological environments, this study's proposed "Emergency Antarctic Climate Treaty Protocol" addresses the connection between minimizing damage to arctic species and in return, increasing the benefits of human communities.

## Proposing the "Emergency Antarctic Climate Treaty Protocol"

The proposed "Emergency Antarctic Climate Treaty Protocol" firstly draws attention to the benefits of urgent action. According to Ruiz-Campillo, Broto, and Westman, the benefit of climate emergency discourse is that it instills collaboration between environmental movements, direct action groups, and youth movements. Through the cooperative pull of "climate emergency discourse" (Ruiz-Campillo, Broto, and Westman 18-19), this study proposes the following policy recommendations of the "Emergency Antarctic Climate Treaty Protocol":

1. The "Emergency Antarctic Climate Treaty Protocol" should recognize the need to drastically reduce CO2 emissions on regional levels to increase the global sustainability of the arctic ecosystem.

2. The resilience of the arctic ecosystem is dependent on sea ice; limiting human CO2 emissions will decrease ice melting and increase the mortality rate of the arctic zooplankton community.

3. Expanding the list of "vulnerable species" in the "Emergency Antarctic Climate Treaty Protocol" to include arctic zooplankton will improve the sustainability of the arctic food chain.

4. Acknowledging the residual impact of the arctic food chain on human communities in the "Emergency Antarctic Climate Treaty Protocol" will work towards minimizing the impact of climate change on human activities and systems.

Where the present "raison d'etre" of the Antarctic Treaty is in *preservation* (Joyner 98), the "Emergency Antarctic Climate Treaty Protocol" aims to increase arctic *sustainability* through urgent action. Where the Intergovernmental Panel on Climate Change predicts an increase in global surface temperature from 1.4 to 5.8°C by 2100 (Samchyshyna, Hansson, and Christoffersen), framing the arctic ecosystem as an emergency speaks to the growing necessity of viewing ecological impacts as future violations of human stability.

## Methodology

With increasing global temperatures and ice melt in Antarctic regions, this study uses the decline of arctic zooplankton communities within the arctic ecosphere to address the necessity of adapting the Antarctic Treaty to contain this study's proposed "Emergency Antarctic Climate Treaty Protocol." To examine the intersection between emergency climate discourse, the Antarctic Treaty, and the arctic food web, this study drew from secondary research ranging from journal articles, environmental policy reports, and scientific studies. To better examine the correlation between ecosystems and human systems within the context of climate change, this research project asked: 1) How does characterizing the arctic zooplankton community as a "vulnerable species" address its essentiality to the arctic food chain? 2) What is the correlation between disruptive impacts to the arctic biosphere and negative impacts on human communities? 3) What role does the "Emergency Antarctic Climate Treaty Protocol" play in addressing the necessity of integrating emergency climate discourse into ice melt trends in the Antarctic? As this study was limited to Antarctica and Greenland and utilized the regional zooplankton community as a case study, it did not draw data from glacier melts in the south pole or other animal species impacted by climate change, such as polar bears. Recommendations for future research include examining the correlation between President Biden's Climate Emergency Act of 2021 and the implications of political pushback surrounding emergency climate discourse within the U.S.

## Conclusion

As Gills and Morgan state, "[The climate emergency], of course, is one aspect of a broader ecological breakdown crisis now facing humanity. The stakes are extremely high: the future well-being, and possibly even survival of the human species, and myriad other species on our planet is now in question. Just posing this possibility of existential threat provokes pushback" (1). As the Protocol on Environmental Protection to the Antarctic Treaty does not address climate change, without maximizing the capacity of human change, the arctic ecosystem—and consequently—human systems remain at risk of mass destruction. Given the importance of the arctic zooplankton community to the arctic food chain, the interconnectivity of biological, environmental, and human systems is critical to reconsidering the current Antarctic Treaty. Categorizing the WAP and arctic zooplankton community as an "emergency locale" and "vulnerable species" speaks to the growing necessity to view the changes to Antarctica as a "climate emergency." However, through the study's proposed "Emergency Antarctic Climate Treaty Protocol," perhaps we can recognize the changes in the cryosphere, and prevent further harm to human activities *through* human activities. And if we are to imagine the implementation of the "Emergency Antarctic Climate Treaty Protocol," perhaps we could draw attention to the connection between human actions and biological reactions within the arctic ecosystem—bringing human responsibility to the equation of ecological change.

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